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This review of literature on the aging process points out primary physiological and psychological changes in maturing adults which have implications for teachers of adults. Visual acuity and hearing decline during adult years and there is a general slowing down process of most bodily activities. Teachers should be aware of the need for good illumination, adequate seating arrangements, maintenance of comfortable physical surroundings, and a slower pace for the adult student. Reports show that although the power to learn is retained in maturing adults, there is a slowing up in the rate at which one can learn. Retention and recall, then, may decline with years, although interest and motivations may be heightened. Teachers of adults should attempt to adjust lessons to the learners' pace capacity; include summaries often; relate activities to the varied life experiences of the students; and be aware of the adult students' length of attention span. (pt)

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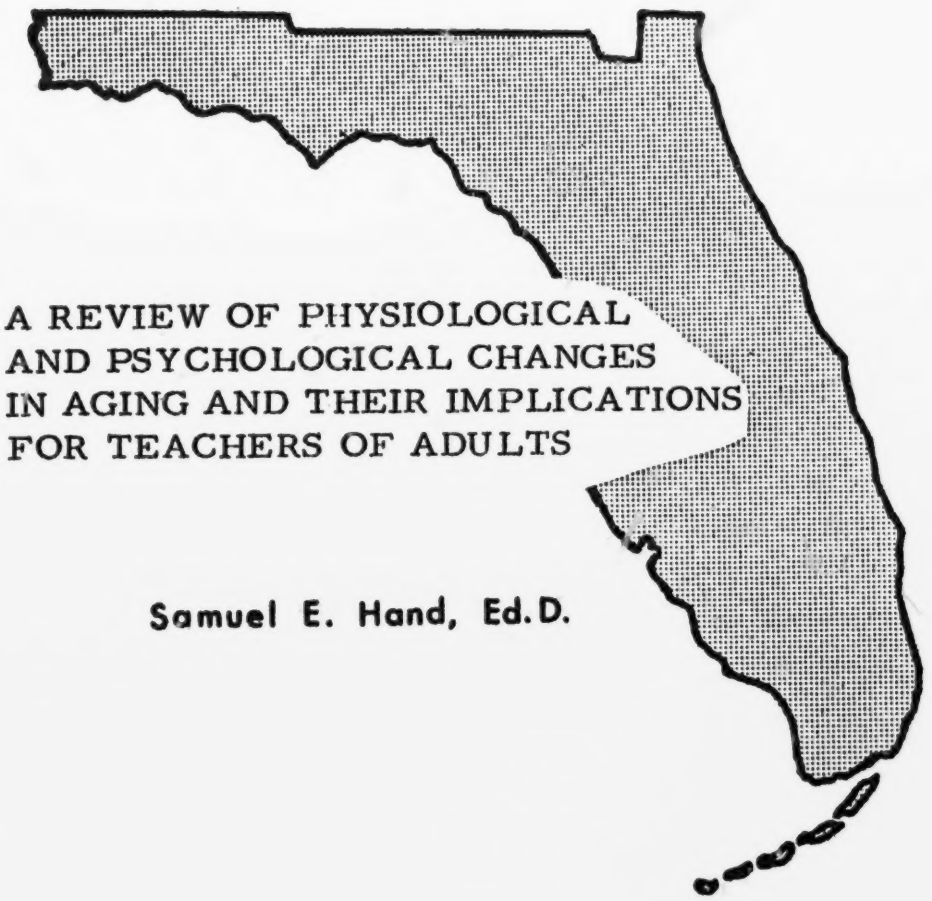

A REVIEW OF PHYSIOLOGICAL AND PSYCHOLOGICAL CHANGES IN AGING AND THEIR IMPLICATIONS FOR TEACHERS OF ADULTS

Samuel E. Hand, Ed.D.

AC 004 301

STATE OF FLORIDA
DEPARTMENT OF EDUCATION

DIVISION OF VOCATIONAL, TECHNICAL, AND ADULT EDUCATION

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ADULT and VETERAN EDUCATION

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A REVIEW OF

PHYSIOLOGICAL AND PSYCHOLOGICAL CHANGES IN AGING

AND THEIR IMPLICATIONS FOR TEACHERS OF ADULTS

Introductory Note

It has become increasingly clear that teachers in adult education, if they are to be really effective, must be ever sensitive to the peculiar needs and characteristics of adults as learners. In order to achieve and maintain this sensitivity to the optimum degree, teachers must acquire a thorough knowledge of the physiological and psychological changes that take place in adulthood as a part of normal aging, and recognize the implications which these changes hold for the teaching-learning process.

A review of the literature on aging reveals a wealth of information and data regarding the physiological changes that occur throughout the normal life span. Considerable material is also found regarding the psychological changes, including adult interests and adult learning up through the age of sixty. Beyond this point, however, there has been much less research, particularly with respect to intellectual changes and learning. It is significant to note that the literature in this field is widely scattered through a great many sources, and extensive investigation is required to pull together the various facts which are significant to adult educators.

In the belief that such material would be helpful to the adult educators of Florida, the writer has examined much of the literature on aging with the thought of preparing a composite review of the significant physiological and psychological changes that take place as a part of the normal aging process, and of pointing out some of the implications which these changes hold for teachers of adults. As the literature was examined, notes were made and statements were recorded from various sources concerning these changes. In addition, such other facts regarding adults and the aging process as appeared significant and relevant to the purposes of the study were also recorded. The findings are summarized in the pages which follow.

PHYSIOLOGICAL CHANGES

Numerous studies having to do with the physiological changes in aging have been based on the data collected by Sir Francis Galton in the year 1884. A national health exhibition was being held that year at South Kensington, England, and Galton set up a booth for the purpose of obtaining accurate measurements of certain physical characteristics among individuals of various age levels. At the conclusion of the exhibition, Galton had measured seventeen physical characteristics on more than 7,000 individuals ranging in age from pre-adolescence through eighty years. His measurements included such factors as stature, sitting height, span of arms, weight, strength of pull, grip of stronger hand, swiftness of blow, vital capacity, visual acuity, auditory acuity, and sense of perpendicularity.

Changes in Vision

Ruger (36) in his study of Sir Francis Galton's data, found that visual acuity attained its maximum at about eighteen years of age and declined continuously thereafter. His curve of visual acuity plotted against age shows a gradual and steady decline from about age eighteen to forty-two, a very sharp decline from age forty-two to fifty-five, and a decrease in the rate of decline beyond fify-five. (See Figure 1.)

Jonas S. Friedenwald, in Cowdry's Problems of Aging (21), points out there is a steady decrease in the average efficiency of all measurable visual functions with advancing age, even in otherwise healthy eyes. The characteristic senile or morphological and chemical changes of the occular tissues are summarized as increased density, loss of water, increased interstitial fibrillar tissue, accumulation in some portions of the organ of an increased amount of inert material, loss of fat and elasticity, together with isolated examples of some rather bizarre forms of tissue atrophy. Friedenwald further points out that aged eyes suffer a greater proportionate loss of visual acuity in dim illumination; that the pupil is small and reacts feebly; that the cornea tends to lose somewhat of its luster and transparency with advancing age, and that the eyelids become thin, lacking in subcutaneous fat, and show a marked loss of elasticity, particularly after the sixth decade.

Miles and Miles (37) state that visual function in terms of accommodation range is a clear measure of physiologic age. They also point out that visual acuity in its decline gives a basic index for psychophysiologic aging--the well-known presbyopia measurement. In visual-perception and visual memory tests on 600 persons ranging from the twenties to the fifties, Miles found decrements in each successive age group.

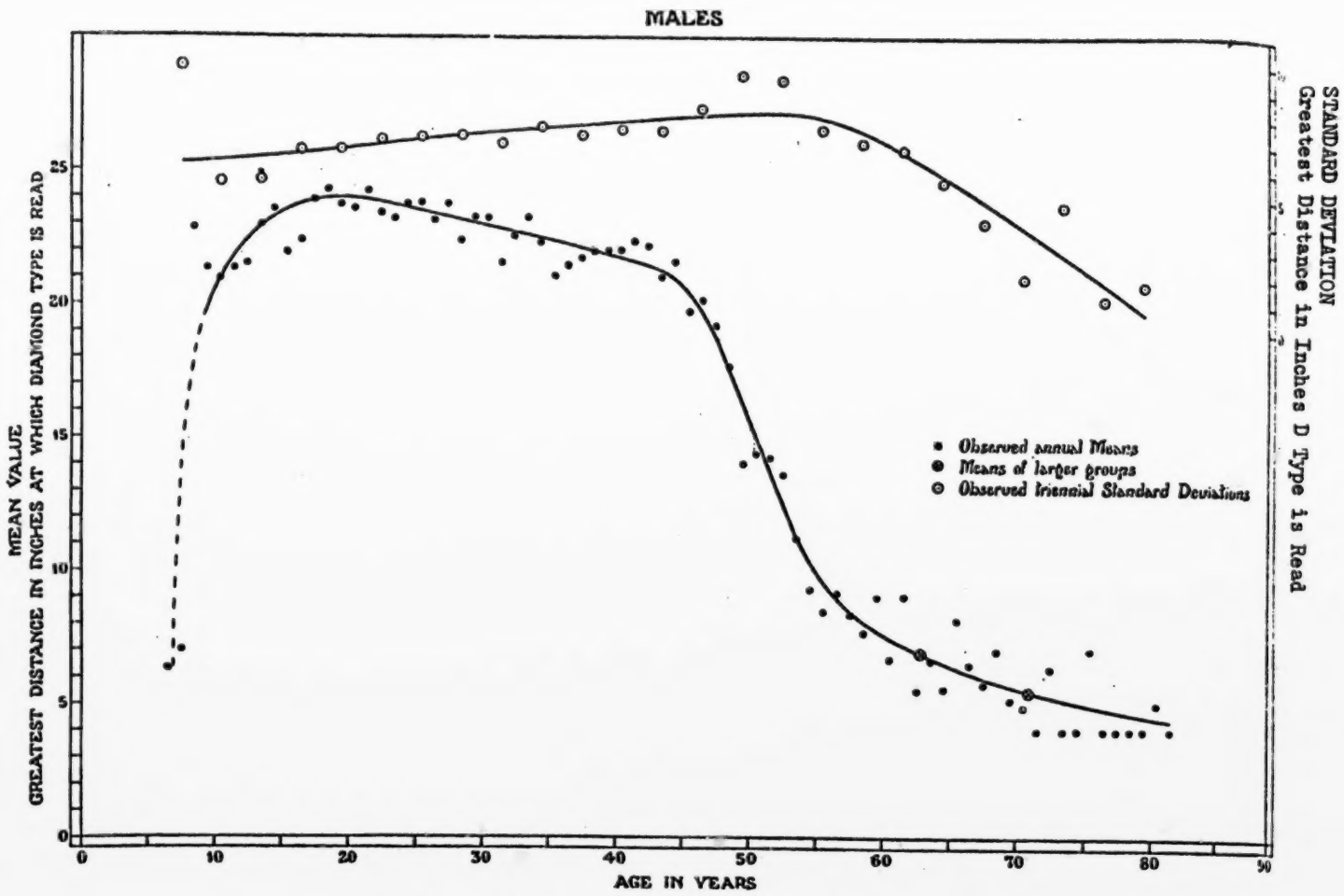
MALES
MEAN VALUE
GREATEST DISTANCE IN INCHES AT WHICH DIAMOND TYPE IS READ
STANDARD DEVIATION
Greatest Distance in Inches D Type is Read
Observed annual Means
Means of larger groups
Observed Triennial Standard Deviations
AGE IN YEARS

FIGURE 1 - AGE AND VISUAL ACUITY
(Reprinted by permission of the Galton Laboratory, University College London, from "On the Growth Curves of Certain Characters in Man (Males)," by Henry A. Ruger, as published in Annals of Eugenics, Vol. II. Parts I and II, 1926.)

Carlson (37) reports a gradual narrowing of the visual field, a slowing down of the dark adaptation (peripheral vision), and a gradually higher threshold for light stimulation for man past the fourth decade. He also says that the incidence of cataracts increases with age, irrespective of whether the tendency to cataract formation is hereditary; that the gradual decrease of elasticity of the lens is a well-known and accurately measured phenomenon of aging; and that there is a diminished translucency of the cornea and vitreous humor with age.

Janouskova, (16) reporting on examinations of 565 men and 446 women, says that with rising age the rate of defective color vision rises, reaching forty per cent in men in the eight decade and eighteen per cent in women in the seventh decade. Of the total men examined, 10.5 per cent had defective

color vision; in women the percentage was 5.8. He found no relation between defects in color vision and occupation.

Lorge and Kushner report studies by Henry C. Smith which show a loss in color matching ability after age twenty-five. There was a feeling expressed, however, that this may be more a function of attitudinal factors than of change in receptor physiology.

Breidenthal (3), in reporting on tests conducted by Ferree and Rand, states that above age thirty-five there is a preference for more light for reading than below thirty-five. This tendency is especially marked in persons between thirty-five and fifty, probably because the eyes are changing in their refractive condition more rapidly than at any other period of the working life. The change is so rapid that it is difficult to keep eyes continuously corrected.

Implications for Teachers

What implications do these research findings concerning visual changes with aging have for teachers of adults? What influence should they exert upon classroom teaching methods and procedures and on the selection and use of audio-visual materials of instruction? Here are a few of the implications that are readily apparent:

For less acute vision:

1. Use good illumination. Older adults must have not only better light, they must have MORE light. Do not have audience face the light. Never have a flickering light.

2. Arrange seating so that people are close to the speaker and to the materials used in class demonstrations.

3. Arrange and use equipment which will enable the audience to see all parts of demonstrations easily and clearly. In addition:

   a. Have a neutral background.
   b. Use sharp contrasts of color
   c. Use large charts, diagrams, and pictures.
   d. Use large, legible writing or printing on large-sized blackboard.
   e. Use simple words and phrases on the board. Avoid the use of abbreviations.
   f. Remove everything from the blackboard except those items which pertain to the subject under discussion.

4. Shiny slate blackboards should be replaced wherever possible with a newer type rough chalk board of such color that maximum contrast can be obtained with selected chalk.

5. Make sure that all duplicated materials for student use are done with pica type and double spacing.

Changes in Hearing

Ruger's hearing curve, on which audio acuity is plotted against age, utilizing Sir Francis Galton's data, shows that maximum auditory acuity is attained between ten and fifteen years of age, very gradually but consistently declines thereafter to about sixty-five, and then tends to level off. See Figure 2.)

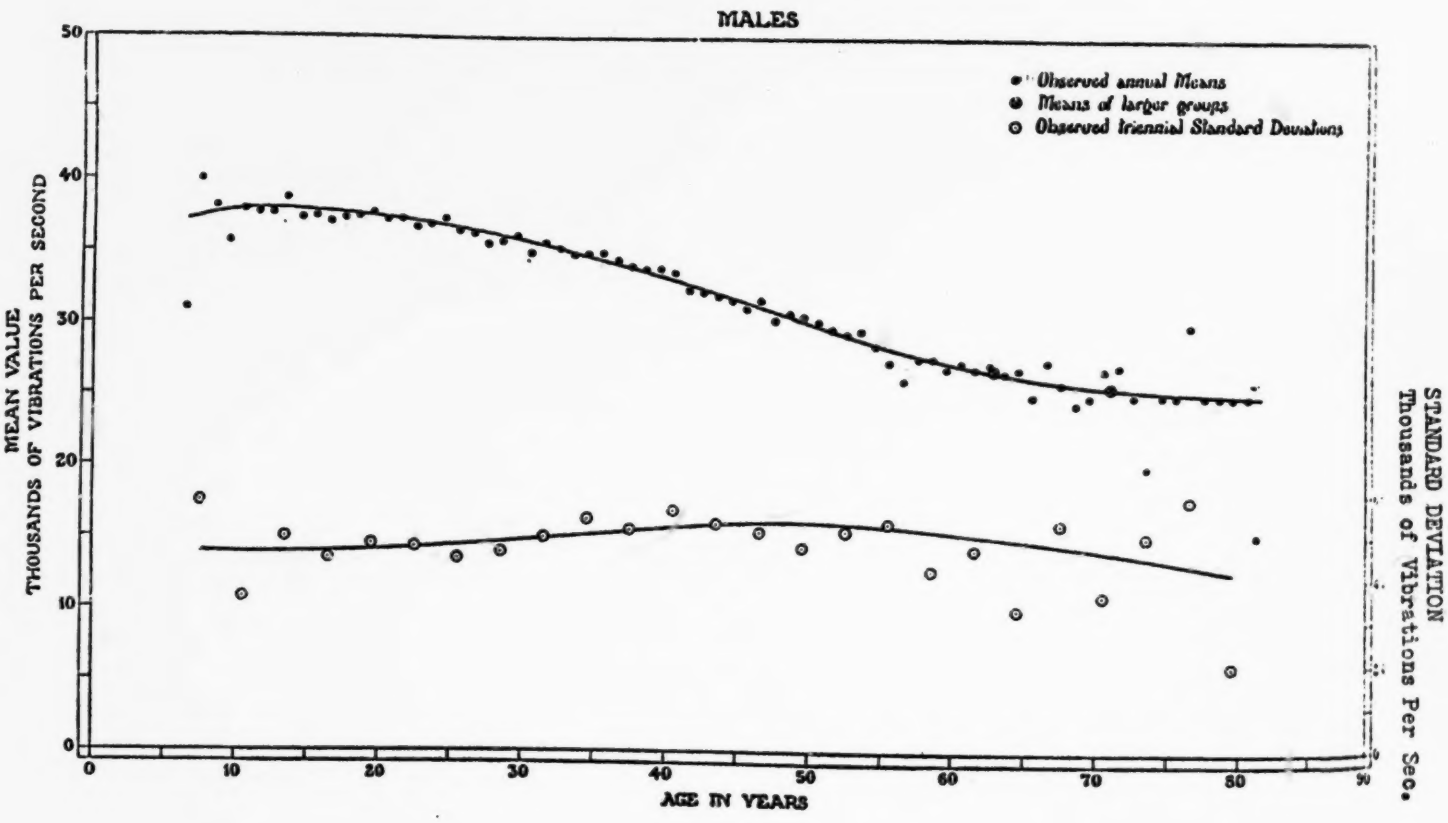

FIGURE 2 - AGE AND HEARING
(Reprinted by permission from Annals of Eugenics.)

Lorge and Kushner (30) report the findings of the National Health Survey studies on hearing ability (45) to show that clinically normal hearing was reduced from incidence of 85 per cent among individuals five to fourteen years of age, to about 12 per cent among those sixty-five and over. Conversely, auditory disability sufficient to prevent understanding of speech originating at a distance two or three feet directly in front, or to prevent using a telephone, increased from an incidence of 7 per cent among five to fourteen year olds to about 64 per cent among those sixty-five and over.

In the above study, using the pure-tone audiometer, it was demonstrated that in the aging process women lose acuity for low pitches while men lose acuity for high pitches.

Lorge also points out that many studies show that auditory reaction time increases with age. In other words, we slow up in our reactions to auditory stimuli as we grow older.

Carlson (37) says that from about twenty on, there is a gradual loss of auditory acuity on all tones, but the loss of sensitivity is greater to the high tones. The deterioration is greater in the male. He attributes the decline in auditory acuity to a gradual but distinct atrophy of the nerve cells in the basal coil of the cochlea. Local anemia, he points out, may also be a factor.

W. P. Covell, in Cowdry's Problems of Aging (21), states that the central auditory processes become slowed down in old age, with the result that cortical interpretation for speech and sounds lacks alertness and concentration. Many aged people find it difficult to follow rapid speech in spite of little or no hearing loss. He feels that for the aged individual with marked hearing loss, the psychological factors such as a feeling of insecurity, fear, and inability to learn new things, readily serve to complicate the situation.

Implications for Teachers

The loss of auditory acuity with advancing age has definite and important implications for teachers of older adults. Some of these may be stated as follows:

For less acute hearing:

1. Speak more slowly and distinctly as the age of the group advances.

2. Stand still, or relatively so, so that those who depend to some extent, consciously or unconsciously, on lip reading will be aided in understanding what is being said.

3. Unusual words, unfamiliar names, numbers, and the like should be enunciated clearly and then printed on the blackboard.

4. Study the faces of members of the group to see whether they are hearing.

5. Use simple, well-chosen words that are clear and meaningful; avoid the use of words that are lengthy and difficult to understand.

6. Use the blackboard freely, particularly when there are some who are not hearing clearly; vision will supplement hearing.

7. Talk directly to the group in a friendly, conversational manner; use well-modulated voice; avoid monotone.

8. Be especially observant and eliminate inside or outside noises that tend to interfere with the hearing of the group.

9. Questions directed to the teacher by members of the group should be repeated for the benefit of the entire group before the questions are answered.

10. Ask someone in the back of the room to call attention when any member of the group cannot hear.

Miscellaneous Physical Changes

Sir Francis Galton's data (36) shows that various motor abilities such as strength of pull, hand grip, et cetera, diminish slowly as age progresses beyond twenty years. (See Figures 3, 4, and 5.).

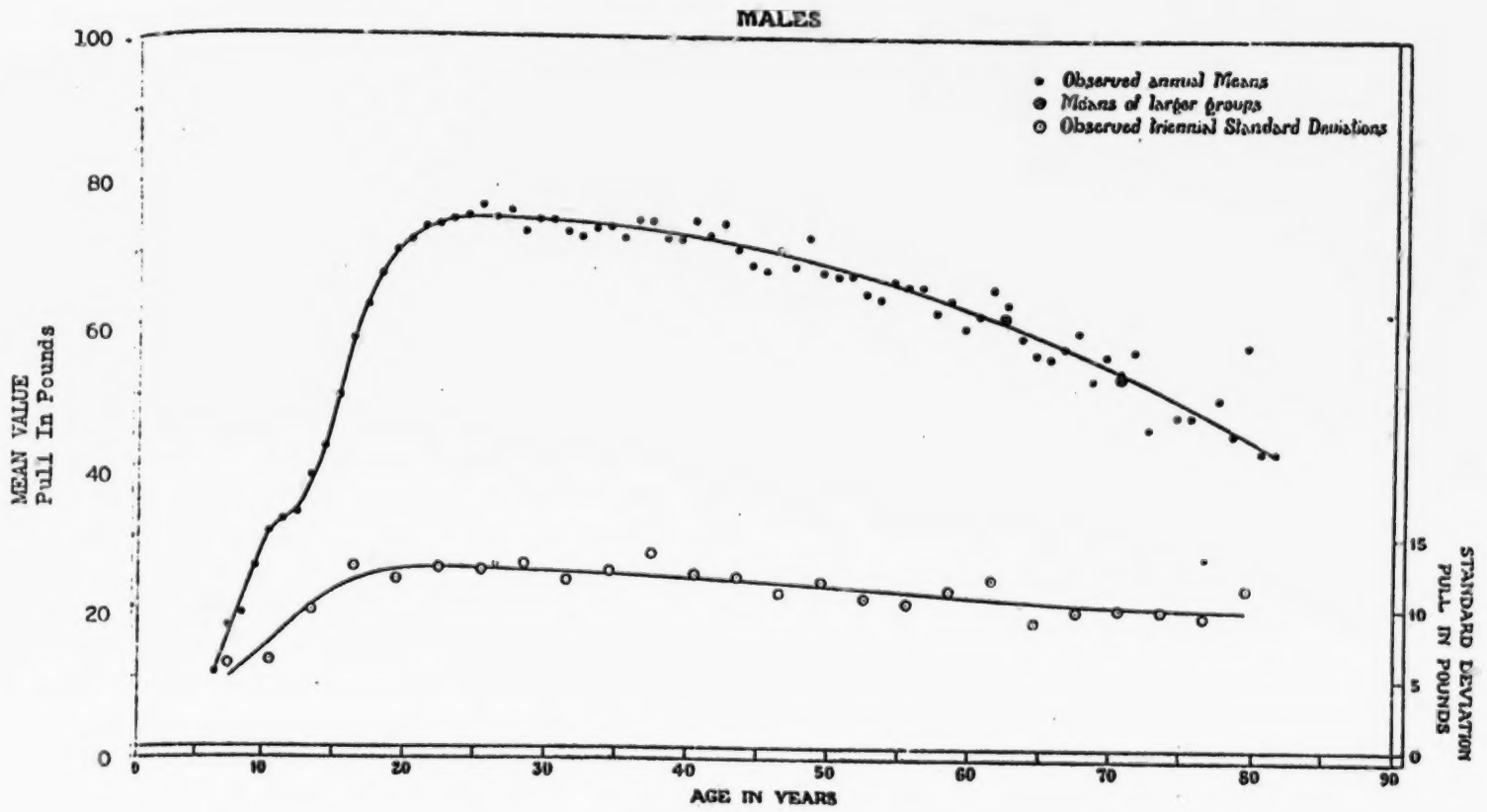

FIGURE 3 - AGE AND PULL
(Reprinted by permission from Annals of Eugenics.)

Carlson (37) lists certain age changes in the physiology of man and other animals which appear at different age levels in the individual and at different age levels in the organ systems of the individual. He points out in presenting these changes that we are here dealing with age changes primarily inherent in the constitution of living matter, no matter how greatly these changes may be speeded up by accidents of living. These changes are:

1. Gradual tissue desiccation.

2. Gradual retardation of cell division, capacity for cell growth, and tissue repair.

3. Gradual retardation in the rate of tissue oxidation (lowering of the basal metabolic rate).

4. Cellular atrophy, degeneration, increased cell pigmentation, and fatty infiltration.

5. Gradual decrease in tissue elasticity, and degenerative changes in the elastic connective tissue.

6. Decreased speed, strength, and endurance of skeletal neuromuscular reactions.

7. Decreased strength of the skeletal muscle.

8. Progressive degeneration and atrophy of the nervous system, impaired vision, hearing, attention, memory and mental endurance.

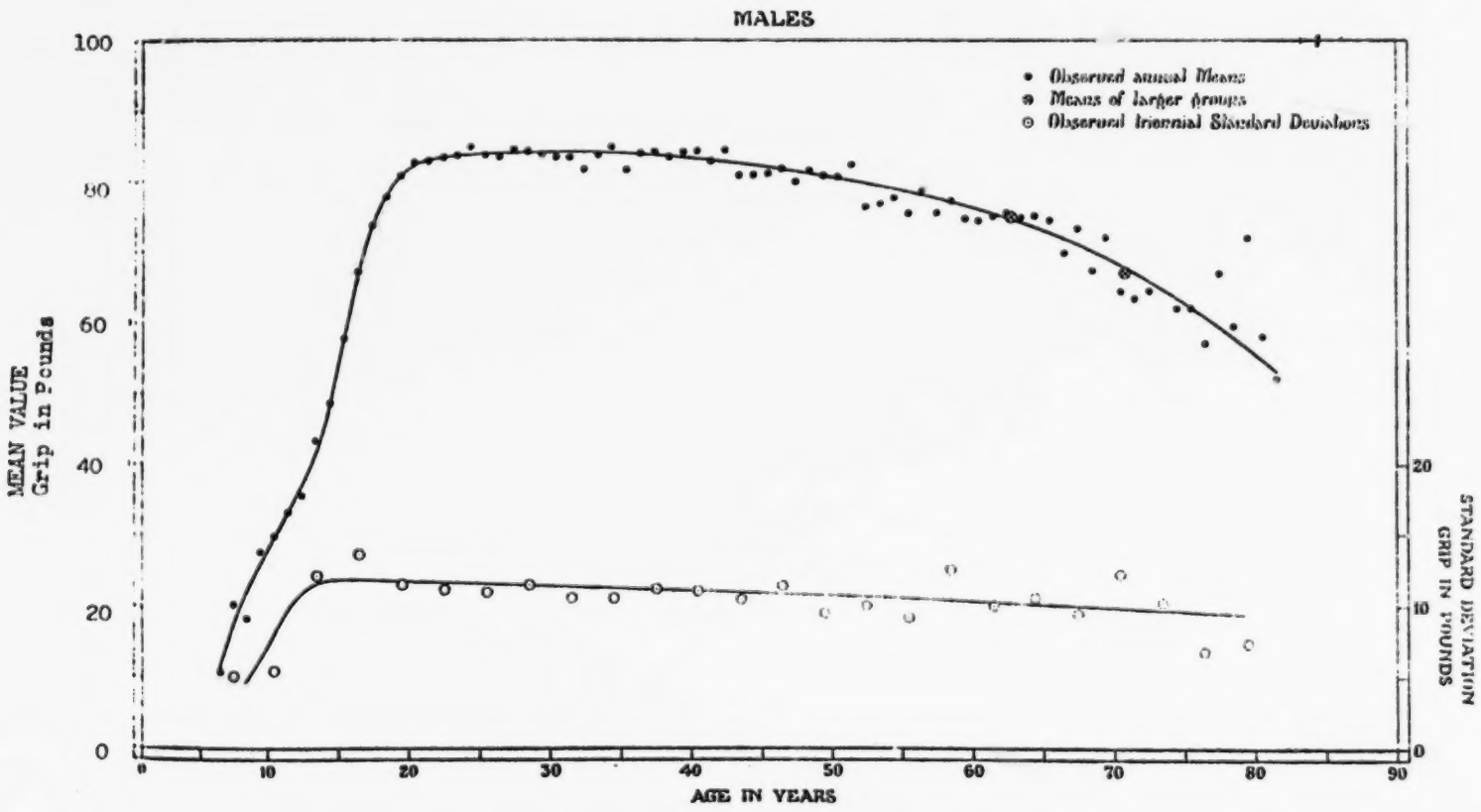

FIGURE 4 - AGE AND GRIP OF STRONGER HAND
(Reprinted by permission from Annals of Eugenics.)

The following miscellane facts about the aging process are also reported by Carlson:

1. The strength of the biceps as the sixth decade of life is only about 50 per cent of that at the age of twenty-five to thirty. The striated skeletal muscle system shows fatty infiltration and brown atrophy as age advances.

2. In persons past sixty, the capacity of the heart to increase in rate and strength of beats during intense physical work is usually diminished.

3. Instead of atrophy with age, the heart increases in size and weight. But this does not mean increased efficiency.

4. The old saying that person is as old as his arteries can still be accepted as partly true. There is decreased elasticity of the aorta, decreased elasticity and increased calcification in all arteries in all people with advancing years--but not at the same rate in all people.

5. It is now certain that the gonads are not a link in the life chain of the individual; their absence does not shorten the life span.

6. Bones become fragile, less elastic, and more exposed to fracture with age. Because of senescent changes in the bone, repair cannot be normal. There is delayed union, and frequently, non-union. Most authorities attribute the changes to arteriosclerosis--that is, impaired circulation and nutrition.

7. Skin changes with aging include:

   a. Increased pigmentation of exposed parts
   b. Decrease of water
   c. Decrease of fat
   d. Decrease of elasticity
   e. Decrease in growth and regenerative capacity.

   At sixty years of age, the same skin wound requires five times longer to heal than it would in a child of ten.

8. Underweight as well as obesity tends to shorten life.

9. The kidneys show progressive reduction in weight after the fourth decade. There is some evidence of actual decrease in quantity of

renal tissue as well as in some renal functions. The kidney, however, usually has sufficient reserve to meet the requirements of age even to 100 or beyond.

10. There are indications of a heredity factor in falling hair, but diet, disease, and vascularity unquestionably play a role.

11. It is well established that the incidence of pernicious anemia increases with age, indicating in all probability an aging factor in the gastric component or intrinsic factor in red cell formation.

12. The incidence of diabetes increases with age, at least up to fifty or sixty. The pancreas of old people shows many scars from accidents and injury of living.

On the average, physiological maturity is reached somewhere around the thirteenth or fourteenth birthday (29). On the other hand, individual differences are so great that some people are not physiologically mature at age twenty. Women, generally, mature from twelve to thirteen years of age, and men from thirteen to fourteen.

According to Shock (21) heat prostration is more frequent among the aged than among the young, The death rate from heat strokes rises sharply after the age of sixty. In fact, says Shock, experimental studies reveal gradually restricted powers of adjustment to both high and low external temperatures as old age progresses. The body temperature with moderate conditions is maintained within the usual range of diurnal variation. However, the limits of adaptation tend to become gradually narrower as one passes through the seventh decade to the later years of life.

Stieglitz (38) says that older people are less tolerant to starvation and to overeating. He further states that in the aged where reaction to stress is lessened, symptoms are less conspicuous. Symptoms of illness are not due to injury; they are due to reactions of the body to the injury, and in later life these reactions are less violent. Older people will often keep going about their routine while suffering with conditions that would put younger people to bed. This is sometimes dangerous because it tends to delay treatment.

Other physical changes that occur in normal aging, according to Stieglitz, include the following:

1. Repair after injury is slowed with age. Convalescence time increases up to twelve times that required for youth.

2. Lessened reserves for stresses and reduced tolerances for heat, cold, overeating, dehydration, and salt depletion are noted.

Miles and Miles (37) found that in complex manual activities, speed and dexterity losses appear as age advances. The rate of decline was gradual from age twenty to sixty, but increased sharply thereafter. Previous experience or practice was found to retard the age influence.

On tests of capacity for physical work, Miles found decline with age. At seventy-one years, the capacity for physical work was found to be about 50 per cent of what it had been at age forty-one. The work-score was about 3.5 per cent higher in the afternoon as compared with morning at ages fifty-seven to sixty-eight.

Dawson and Hellebrandt (6) also found that working capacity fell off with age, and that afternoon scores were better than morning scores.

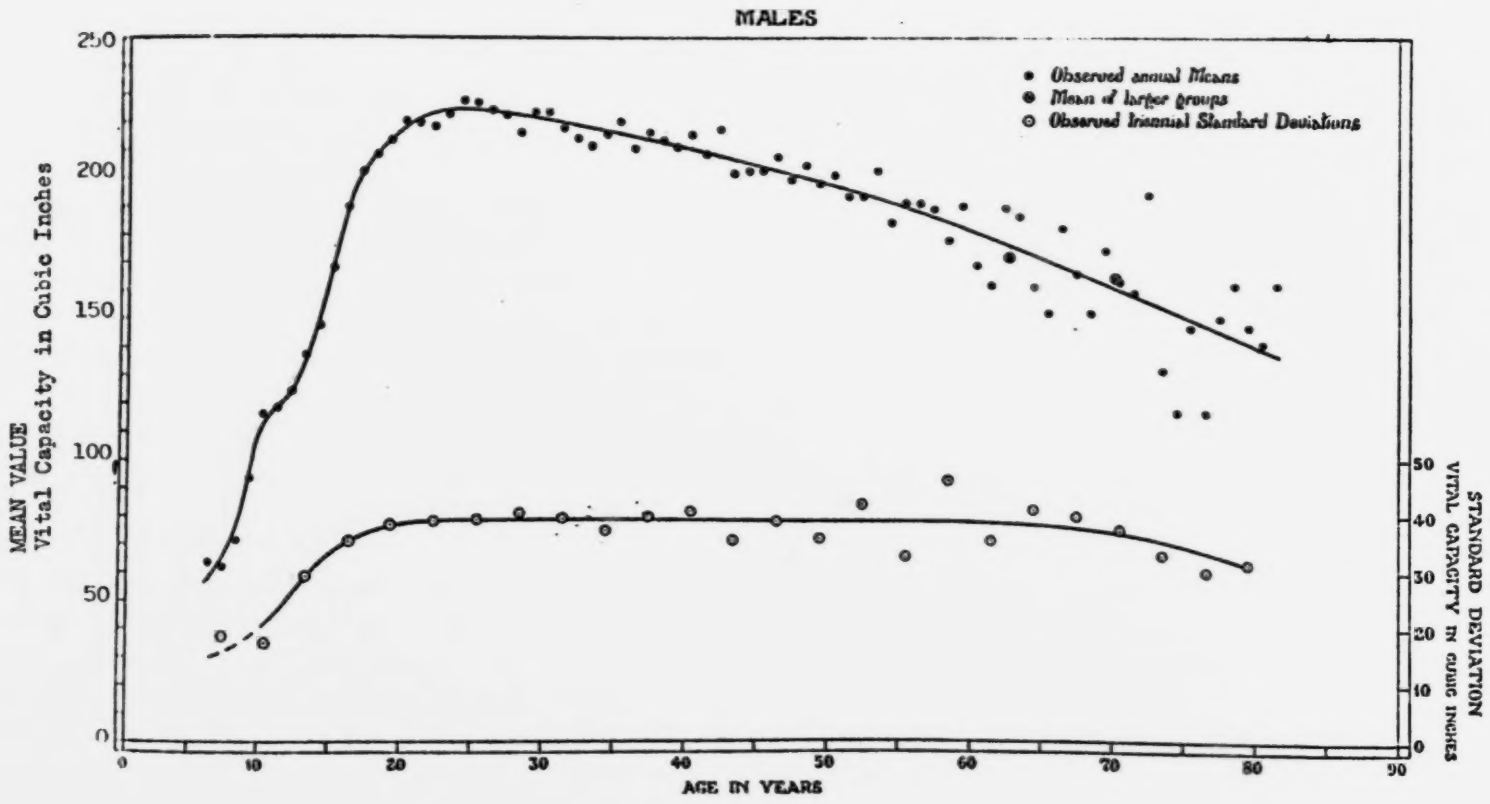

FIGURE 5 - AGE AND VITAL CAPACITY
(Reprinted by permission from Annals of Eugenics.)

Lehman (24) reports evidence to show that the tendency to attribute to the age factor things that have little or nothing to do with age per se should be reoriented. He presents 115 biological excerpts in which he cites examples of outstanding creative achievements completed not earlier than the late sixties.

Lorge and Kushner (30) cite certain studies made at the Harvard Fatigue Laboratory which also indicate that the quality of work does not decline very rapidly after age forty-five. They point out also that there is considerable evidence otherwise to show that the age at which eminent people do their best work does not coincide with physiological prime. For example, out of the 100 most important inventions, 37 were made by men over forty and 16 were made by men over fifty.

The general physiological changes in aging imply that the human organism consciously or unconsciously alters its mode of life to adjust to these changes. Lorge feels that perhaps one of the more subtle adaptations to physiological change is the choice of work tempo.

Implications for Teachers

For the slowing up in physical tempo and the narrowing limits of homeostatic adjustment the following implications seem to appear:

1. Older adults must be permitted to choose their own work tempo. They should be encouraged and stimulated, but not rushed.

2. Be particularly attentive to the physical comfort of older adults; maintain classroom heat and ventilation within proper limits; arrange for use of the most suitable furniture available.

3. Arrange for an accessible meeting place--one which requires a minimum of stair climbing.

4. Arrange the schedule of meetings insofar as possible to best suit the group.

5. Maintain a pleasant social atmosphere in the classroom.

6. Do not hold meetings overtime.

7. At the appropriate time, emphasize the importance of individual responsibility. with respect to avoidance of environmental extremes and conditions of stress on the part of older adults.

PSYCHOLOGICAL CHANGES

Changes in Intelligence and Learning

The literature shows that psychologists differ rather widely as to the effects of age upon intellectual capacity or the power of the individual to learn. It shows also that there exists among the older people, as well as the general population, long-accepted stereotypes of the aging which tend to picture the older person as one whose physical and mental capacities are deteriorating and whose general interest in life is gradually diminishing. Research up to this time has not been sufficiently extensive or intensive to give unequivocal evidence of the influence of age upon intellectual capacity. (42).

Thorndike (41) some twenty-five to thirty years ago did considerable research on the question and his conclusions were as follows:

1. The acme of ability (to learn) is reached at some point between twenty and twenty-five years of age. (See Figure 6.)

2. There is a decline in capacity for learning from the acme (twenty to twenty-five years) to about forty-two years of age of from 13 to 15 per cent, or approximately one per cent per year.

3. The influence of intellect upon the curve of ability to learn in relation to age is very slight. The ablest man and the ordinary man show very nearly the same curve.

4. Individuals on the average probably learn much less from twenty-five to forty-five than they did from five to twenty-five. This is attributable to various combinations of four factors: general health and energy, ability to learn, interest in learning, and opportunity for learning.

5. By the age of twenty-five most persons have, within certain limitations, learned a great part of what they wish to learn.

Following World War I, Jones and Conrad (17) administered the Army Alpha Tests to 1,191 unselected rural New England subjects from ten to sixty years of age and when the results were plotted against chronological age it showed rapid intellectual growth to about sixteen years, a negative acceleration to about eighteen or twenty years, and a gradual but steady decline thereafter. The performance at the fifty-five year level was about the same as that of the fourteen year old. The subtests on vocabulary and general information failed to exhibit a post-adolescent decline, as did the other tests. The most rapid decline was found to be on analogies, common sense, and numerical completions. Jones and Conrad concluded that the tests on vocabulary and general information were the least valid indications of intelligence, and

considered their findings as confirming Thorndike's conclusions--that intelligence declines steadily beyond the age range twenty to twenty-five years. They also concluded that speed was an unimportant factor in the measurement of intelligence.

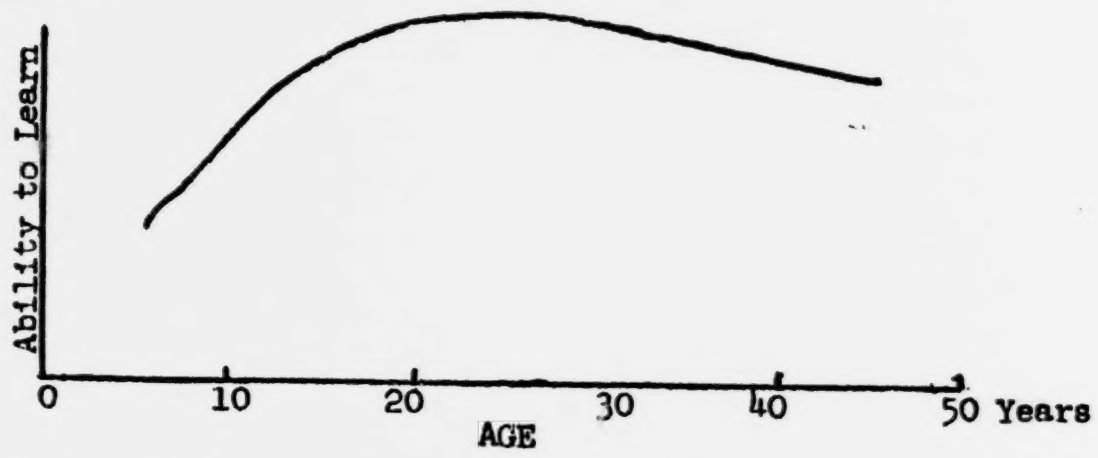

FIGURE 6 - THE GENERAL FORM OF THORNDIKE'S CURVE OF ABILITY TO LEARN IN RELATION TO AGE
(From: Thorndike, E. L., Adult Learning, New York: Macmillan Company, 1928, p. 127. Reproduced by permission.)

Weschsler and Shakow (46) conclude on the basis of various studies of intellectual and physical ability that: (a) intellectual ability as a whole follows the same general pattern decline as does physical ability, and (b) the individual abilities (vocabulary, memory, et cetera) which enter into general intelligence must of necessity partake of this decline, but not necessarily at the same rate.

Litwinski (25) concludes that while perception declines in old age, other factors such as imagination and intuition seek to replace the failing powers.

Lawton (23) says that clinical evidence convinces him that if the speed factor is eliminated and only mental power is considered, the difference between older and younger people is reduced.

Foulds and Raven (9) administered the 1938 Progressive Matrices and the Mill Hill Vocabulary Scale to 1,047 engineers and 920 male employees of an industrial firm--one competitive and one non-competitive in situation. The rate of decline in the Matrices Test was uniform from age twenty-five on; the vocabular scores showed a constant rise to about thirty, with little decline to age sixty. On the basis of this they concluded:

1. The average person's ability to form comparisons and reason by analogy increases rapidly during childhood, reaches its maximum

at about age fourteen, remains constant to about age twenty-five, and then declines steadily to age sixty and then more so to eighty, at which age the average person can reason by analogy about as well as an eight year old.

2. The ability to recall information increases normally up to age twenty-five and remains constant for twenty-five to thirty years.

Miles and Miles (37) cite the results of intelligence tests by many investigators as giving what they consider to be clear-cut evidence of the following:

1. Score decline from young adulthood to old age.

2. Greater decrement of "speed" versus "power" of intelligence.

3. Better preservation with age of the verbal as compared with the mathematical and manual functions.

4. Wide individual differences in score at every age.

In connection with age-score curves on intelligence tests, Miles makes the following observations:

1. If speed of reaction or youthful vigor is essentially involved in the test performance, decrement begins to appear early in adulthood, is continuous, and tends, in later age, to become excessive.

2. On the untimed or "power" tests of intelligence, score decrement occurs with age, but the rate of decline is slower.

3. The average decade scores of men and women are generally about equal whatever test is used, and they describe about the same decrement curve.

4. At every adult age the best and the poorest scoring 25 per cent differ from the average by an amount that is more than three times the usual decade to decade loss.

With respect to learning, Miles points out that learning ability is closely correlated with intelligence. He says that training utilizes capacities and practice maintains them. Measured ability to learn is maintained slightly better than the capacity to d mixed problems of the intelligence test type. If learning were required of all people in all subjects, the decline of competence with age might be similar to that of intelligence test capacity. Since learning is selective, however, and generally follows interest, the waning of capacity is retarded by the favorable factors which motivate the choice of material to be learned.

Learning obviously depends upon attention, retention, and recall, says Miles. That these separate elements show greater decline with age than does learning itself simply means that in the latter other factors are also involved. Wanting to learn is the greatest aid to learning. Interest in the subject to be learned aids in the mental organization necessary for attention and retention. Attitude, interest, and motivation are better sustained as age advances than is the speed of activity, and they tend to channelize and conserve effort in the direction of organized patterns of experience. In childhood, active, varied learning is the rule; in maturity, active learning usually practiced in areas defined in terms of interest.

There is no veto power over learning exercised by age at any period in the normal life span, according to Miles. While experimental psychologic results are in agreement in indicating age decrements in adult learning, at the same time they definitely support the formulation that no one is ever too old to learn.

Donahue (43) makes the following observations with respect to intelligence and learning in the aging:

1. The general age curves for psychological functions are parabolic in shape.

2. The same abilities decline at different rates in different persons.

3. Judgment and reasoning ability reach their peak latest of all abilities.

4. Age differences and age changes have frequently been confused.

5. There is good evidence to support the view that the greater the individual's intellectual endowment and the greater the amount of education, the less steep is the decline in intellectual ability, other things being equal.

6. Exercise of the mind seems to retard deterioration of intellectual processes.

7. If minds are kept active through exercise of intellectual and creative imagination, outstanding achievements in fields not involving physical powers is possible in the seventh and perhaps even the eighth decade.

8. The older adult can continue to learn meaningful things; comprehension of difficult reading shows little or no change with age; but there is a decline in ability to remember isolated facts.

9. The speed of perception steadily decreases from decade to decade. If not too marked, defects of sense and perception can be compensated for by experience and persistence in practical situations.

Lorge (26, 27, 28, 29, and 30) differs from the majority of other psychologists in his conclusions regarding the effects of age upon intellectual capacity. Observing that the conclusions of others regarding intellectual decline were based usually on tests which depend for performance on both speed and power, he set out to measure the two factors separately. Lorge felt that the older people were being penalized in "speed and power" tests by virtue of the inevitable physiological changes which take place with aging and serve to slow them down, but which, in his opinion did not necessarily reduce their capacity (or power) to learn.

To test this proposition Lorge administered four kinds of tests to a large number of WPA workers of different ages. First, he gave these people the IER Intelligence Scale C.A.V.D., a test of intellectual power with unlimited time allowance. He then selected a number of those at various age ranges who had made the same scores on the C.A.V.D. power test and gave them three timed tests of "speed and power," utilizing the Otis Self-Administering Test of Mental Ability (20 minutes), the Army Alpha, and the Thorndike Intelligence Examination for High School Graduates. The following are the results:

	Age	Scores			
		Unlimited Time	Limited Time		
Group	Range	C A V D	Army Alpha	Otis	Thorndike
1	20-25	405.3	149.6	44.4	66.9
2	27 1/2-37 1/2	405.7	142.3	39.3	60.3
3	40 and over	405.5	128.7	33.4	53.0

From the above Lorge observed that the tests allowing a limited amount of time show a steady decline with age while the test which allowed unlimited time showed virtually no change from one age group to the other. He concluded, therefore, that there is a decline in rate of learning as age progresses, but that intellectual power in and of itself does not change from about twenty to beyond sixty. (See Figure 7.) He attributes the decline in rate of learning to the losses in visual acuity, auditory acuity and reaction time, primarily. The increased fear of failure and general attitude of reluctance toward learning on the part of older adults were also mentioned as possible factors in the decline.

Lorge goes on to show that if the correction for loss of .780 point per year of age beyond twenty due to speed, as revealed in his data for the Army Alpha, is applied to Jones and Conrad's data, the results would then be consistent for all age groups in their study.

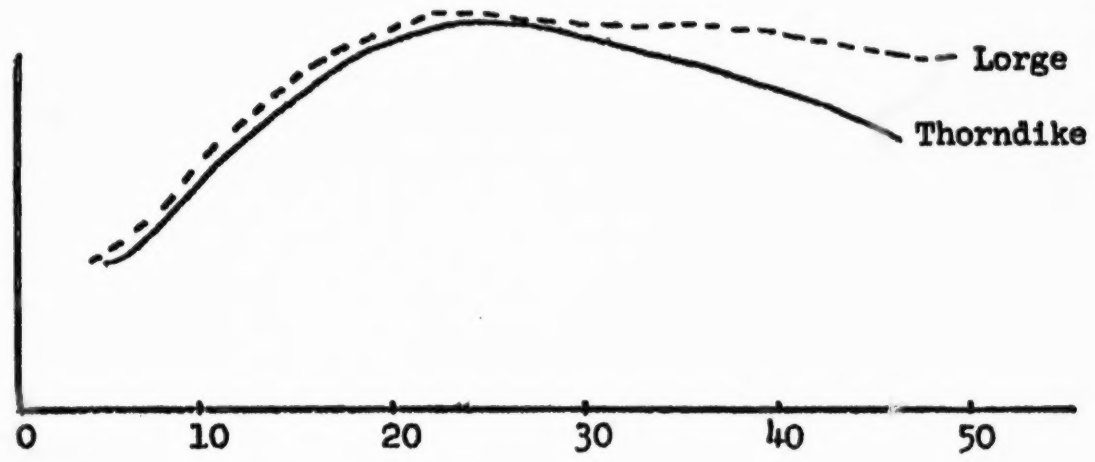

FIGURE 7 - CONTRAST OF LORGE'S AND THORNDIKE'S GENERAL CURVE OF ABILITY TO LEARN IN RELATION TO AGE

Changes in Interests and Attitudes

Strong (39) made an extensive study of the change of interests with age among adults. He found that some interests increase and some decrease with age. In some cases the changes are very slight, in others they are great, but there is no reason, he says, to assume that interests alter capriciously, inexplicably. Each interest waxes or wanes in a definite way.

Analyzing vocational interest blanks filled out by 2,340 men between the ages of twenty and sixty, representing eight professions, Strong arrived at the following conclusions:

1. Older men are no more catholic in their interests than younger men; they have as many likes and dislikes as younger men but their likes and dislikes are not identified with those of younger men.

2. Change in interest does not take place uniformly from twenty-five to fifty-five. In round numbers, 50 per cent of the total change occurs between twenty-five and thirty-five, 20 per cent between thirty-five and forty-five, and 30 per cent between forty-five and fifty-five. There is little or no change from fifty-five to sixty-five.

3. Changes in interest from decade to decade are not great. Differences as represented by occupational interests are much greater than differences due to age.

4. Items suggesting physical skill and daring (such as walking along a precipice, or being an aviator) show the greatest change of all. Older men do not like such activities as do younger men.

5. The next greatest change is registered by items suggesting change or interference with established habits or customs.

6. With few exceptions, liking for occupations decreases with age.

7. Linguistic activities of an oral or written nature decline in interest, but those involving reading increase in liking with age.

8. Many amusements are liked by large percentages at all ages. There is a distinct tendency, however, for all of them to decline except those that may be characterized as cultural. These increase in liking. Older men also prefer, more than younger men do, those amusements pursued alone in contrast to ones involving others.

9. Liking for people exhibiting desirable traits increases with age, as does disliking for people exhibiting undesirable traits. Evidently men are more unamimous in their likes and dislikes toward kinds of people than toward any other group of items.

10. Older men are somewhat surer of their estimates of themselves than are younger men.

11. In general, the things we like most at twenty-five years of age are liked better and better with increasing age, and the things we like least at twenty-five are liked less and less.

Strong makes the observation that every interest, seemingly, is based to some extent on innate qualities, largely of an emotional nature. But interests are also expressions of experience and learning. Thus, interest in cabinet-making can only continue if the workman's skill is sufficient to enable him to turn out work that merits approval from his associates and from himself.

Thorndike (40) offers the following conclusions, based on his research on adult interests:

1. There is a slight decrease in the total volume of interest from the twenties to the fifties. The decrease is restricted largely to the physical activities.

2. The interests needed to support adult learning show no decrease. In them there is no steady, unavoidable decline or "drying up."

3. Interests can be modified. Likes and dislikes can be learned by adults as truly as names or dates.

4. The general principles of modifiability and control of interests are the same for all features of human nature. Interests and everything else are strengthened by causing them to occur, and by rewarding them.

5. Learning without interest of some sort does not occur to any appreciable degree. Results of experiments present these facts: first, lack of interest is a handicap; secondly, the handicap is small. Adults can learn wrong meanings of words, wrong birth dates of celebrities, and false biographies (all of no intrinsic value or interest whatsoever) nearly as well as true and useful facts.

6. Whatever difference exists between young adults and old adults as to willingness to learn, interest, ability to apply their minds, et cetera, are moderate in amount, and will not prevent the older group doing at forty-five on a somewhat reduced scale almost anything they could have done at twenty-five.

7. On the whole, the older adult is more influenced than the young adult by uselessness and harmfulness of the material to be learned. We may estimate roughly that 10 to 20 per cent more time would be needed for the old adult than for the young adult to counterbalance the change from fairly useful content to utterly useless or harmful content.

8. The old suffer greater dimunition in the amount learned under conditions of mild bodily discomfort than do the young.

9. The old suffer more than the young from being frustrated by deprivation of success, but not much more.

Miles (37) says that even at eighty, the attitudes and interests of men and women, although nearer together than at any other time since early childhood, are yet significantly diverse. The changes with age appear to follow the pattern of:

1. Waning of active in favor of passive pursuits;

2. Waning of social in favor of individual recreations;

3. Waning of variety in favor of narrowing selection;

4. Waning of changing environments in favor of a comfortable, settled routine.

In a study of attitudes and adjustments of 396 recipients of old age assistance in New York State, Morgan (32) reached the following conclusions:

1. Men had better health than women, and a close correlation exists between health and happiness.

2. Forty per cent of the happiest people had more than an elementary education, while only 24 per cent of the unhappiest ones had more than elementary schooling.

3. Seventy per cent of them said they would be much happier if they had a job.

4. Forty-four per cent rated themselves as physically capable of holding a job.

5. Work and social responsibilities were the sources of greatest happiness.

6. Women find it easier to occupy themselves. Thirty per cent more women than men reported they had plenty to keep them busy.

7. Most of them considered young adulthood (twenty-five to forty-five years of age) to have been the happiest period of their lives.

8. Finances, concern for spouse, and poor health were, in that order, reported as sources of greatest worry.

9. There are no aged characteristics as such; traits exhibited by the old are as varied as those shown by a group of young people, and are determined by the same factors--cultural, educational, economic, and sex differences.

Cavan (5) says that the attitudinal and emotional changes that occur in old age are characterized by:

1. Worry, especially over health and economic security;

2. A sense of inadequacy, leading to feelings of insecurity, anxiety, or guilt;

3. Feelings of being unwanted, isolated, and lonely;

4. Attitudes of suspicion;

5. Narrowing of interests, leading to introspection and increased interest in bodily sensations and physical pleasure;

6. Loss of interest in activity and increased interest in quiescence;

7. Reduction of sexual activity but sometimes increased sexual interest, especially in the male; regression to earlier levels of sex expression;

8. Conservatism;

9. Inability to adjust to changed conditions;

10. Over-talkativeness, especially of the past;

11. Hoarding, often of trivial things;

12. Tendency to relive past events.

Miscellaneous Psychological Changes

The following are miscellaneous facts and conclusions regarding the psychological aspects of aging, reported by various writers:

1. The most critical years in the aging process occur between the fortieth and sixtieth years. It is in this period that most can be accomplished in preparation for successful old age (14).

2. Frequently the fear of aging, rather than the aging process itself, induces mental deterioration. This is the result of social pressures in our society and calls for a better understanding of the place of the aged in the picture of the full life span (14).

3. A study of over 700 people whose mean age was 85.5 years and who lay at the two extremes of wealth and poverty revealed the following formula for longevity:

An increase of life duration is favored by marriage, descent from healthy, long-lived parents and grandparents, breast feeding, moderation and regularity in the conduct of life, cheerfulness and occupation till a ripe old age, and retardment of retirement (14).

4. It must be emphasized that (in aging) all changes are not necessarily in the direction of decline. For example, although muscular strength, vigor, and speed of reaction decline with advancing years, skills tend to increase with long practice. Though there may be less intense emotional drive or ambition, there occurs an increasing loyalty and calmness, with clearer definition of purpose of living, upon further maturation. These compensate for the restless drive of ambition in youth (14).

5. Careful studies on learning have revealed that the maximum speed and rate of learning occurs at age twenty-two. At age eighty the rate of learning is practically the same as at twelve. However, there are qualitative as well as quantitative differences in ability to learn. Though speed is lost, accuracy is increased (4).

6. A definite non-chance relationship was found to exist between participation in constructional activities in childhood (six to eighteen) and participation in constructional activities either as hobbies or favorite leisure activities in adult life. The desire or lack of desire to participate in such activities in adulthood depends largely upon whether one has or has not done so in childhood. (33).

7. Adults are proverbially less ready to adopt new ways, or even to try new ways, than adolescents (41).

8. It is generally recognized that certain mental changes may be looked for as accompaniments of normal senium. In general, the first thing noticed is a slight decrease in alertness, a tendency to slow up, and a narrowing of the span of interest. Accompanying this, and at the start rather insidious, is the loss of memory, particularly in the field of spontaneous recall. The patient becomes somewhat absent-minded, he forgets where he has put things, cannot remember names, and perhaps later on, forgets faces. This impairment of memory is most striking for recent events, the events in one's earlier life standing out in bold relief, often being described with considerable prolixity (37; Overholser).

9. We know that work is a good means for the retardation of senility (11).

10. Older workers are:

    a. Steadier in their jobs, require less frequent replacement, and are less expensive in training;
    b. More careful with equipment, less wasteful of materials, and have fewer industrial accidents in relation to hours worked;
    c. Less distracted by social interests and tend to develop a strong sense of loyalty and responsibility;
    d. Sick more often, and require longer to recover from illness or accident, but they show greater caution and have a lower accident rate (37; Miles and Miles).

11. The expressed interests in leisure pursuits of 1,500 cases were examined, and those interests actively pursued were tabulated by Reeves and Slater. The most popular interests were found to be non-competitive sports, constructional activities, and reading. The span of interest did not change appreciably with age, although the direction of interests increased, with a greater variety of interests found at older ages. Intelligence was found to be associated with span of interest, and the more intelligent had the more mature interests. (35).

Implications for Teachers

Implications for teachers of adults as indicated by these research findings on the psychological changes with aging seem to fall into three categories: First, the general tone of the research shows that there is a substantial retention of the POWER to learn, but a slowing up in the RATE of learning as we grow older. The implications for teachers in this and related facts developed in the research would seem to include the following:

1. Expect quality--but remember that it will take longer to produce it.

2. The scope of lessons must be planned with due regard for speed capabilities of members of the group.

3. Present new material in the most logical sequence, step by step, and relate it to what is already known. Short units of work will tend to give adults a feeling of success and mastery, and this is highly important.

4. Utilize various instructional aids to help establish important concepts and relationships. Write things on the blackboard as they are explained. Double exposure (sight and hearing) will help solidify learning.

5. To help compensate for slower correlation of ideas, select the central idea or principle, then plan class demonstrations, explanations, and discussion so as to develop and reinforce the basic, central idea.

6. Repeat important points frequently.

7. Summarize often--remember the difficulty of older adults on spontaneous recall.

8. Because of the widespread existence of negative attitudes regarding the ability of older adults to learn, the teacher must make a special effort to reassure adults on this point; he must overcome their feelings of insecurity and fear of competition with younger adults and give them a new sense of security and mastery.

9. In laying out tasks to be performed in the learning process, the teacher must make sure that the adult sees the relationship of the tasks at hand to his ultimate objective.

10. Since learning flows primarily from the consequences of satisfaction and reward, every opportunity should be utilized with adults to praise good work. By the same token, errors should be minimized and all kinds of punishment (including sarcasm and ridicule) avoided. Accent the positive(success), not the negative (failure).

11. Do not forget the importance of short recesses (or breaks) for adults.

12. The adult comes to school with a purpose. Often the urgency and seriousness of his purpose results in a drive for achievement which becomes a source of discouragement. He may expect more rapid achievement than he is capable of producing. The teacher must be keenly observant for signs and symptoms of this difficulty, because if not detected and proper counsel and encouragement given, the individual will drop out with a feeling of disappointment and frustration.

Secondly, the wide range of individual differences in age, ability, previous education, and interests of adults would seem to hold the following implications for teachers:

1. Remember that every member of the group is a voluntary participant. As such, each one is there because he wants something. One of the most difficult and important jobs the teacher faces is that of finding out what each person's particular interest or need is. Unless the adult gets what he is coming for, he will soon stop coming.

2. Every group of adults has a wide assortment of talents, and these constitute rich resources for the group. To identify these resources, there should be an early effort made in every group to get acquainted all around. The teacher has a particularly important responsibility here in studying the background, interests, needs, and capabilities of each member of the group, so as to plan the work for the group and utilize to the optimum degree the talents of each member for the benefit of the group as a whole.

3. In the classification of adults for placement, and in dividing a class because of size, do so on the basis of previous education rather than age.

4. Do not give adults "busy-work" to do. Engage them in challenging meaningful activity, according to their particular interest.

5. Make everyone feel that his opinions, needs, and thoughts are important.

6. Encourage everyone to share in group activities. This will give older adults the feeling of belonging oftentimes needed to allay their fears about returning to school.

7. Remember that the adult brings with him much of the vocabulary and stored knowledge which will facilitate and give depth to new learnings.

8. In learning new skills, adults often have to "unset" old patterns, long established. This may be almost frustrating in extreme cases. It is time consuming in all cases. Teachers can soften the effect of this experience for the older learner by explaining that this is a common problem, not at all peculiar to him.

Finally, the sum total of all the changes that constitute the aging process seems to be an appalling lack of proper adjustment on the part of a large percentage of our aged population. In this fact seems to lie one of the most significant implications of all. Not only teachers, but all educators, and particularly adult educators, must become concerned with the job of finding ways and means of helping adults reach old age in a more satisfactory state of adjustment. Steps must be taken to get across to adults the kinds of information they need about the aging process to help them formulate a wholesome philosophy about growing old. Ways must be found to train adults in the techniques of attaining high levels of personal adjustment. We must also provide training and retraining in the skills and knowledge which will make it possible for them to continue in employment and socially satisfying activities. And finally, we have a responsibility in the much needed job of convincing our respective communities all over the land that people can learn throughout life, and that our older people deserve and must be given the opportunity of continuing to use their skills and productive capacities and to participate in the social life of our communities.

BIBLIOGRAPHY

(1) Bourliere, Francois. "Some Physiological Characteristics of Senescence in the Rat." Psychological Abstracts. Translated. XXII (1948), 2569.

(2) Breckinridge, Elizabeth Llewellyn. Effective Use of Older Workers. Chicago: Wilcox and Follett Company, 1953.

(3) Briendenthal, Leslie, et al. "Application of the Facts About the Changing Physiology of the Eye and Ear in Adults." Unpublished paper prepared in connection with Education s207AK under direction of Dr. Irving Lorge, Teachers College, Columbia University, August, 1949.

(4) Carlson, Anton J., and Stieglitz, Edward J. "Physiological Changes in Aging." Social Contribution by the Aging. Edited by Clark Tibbitts. In American Academy of Political and Social Science, Philadelphia. (Its Annals, Vol. 279.) Philadelphia: 1952, pp. 18-31.

(5) Cavan, Ruth Shonie, et al. Personal Adjustment in Old Age. Chicago: Science Research Associates, Inc., 1949.

(6) Dawson, P. M., and Hellebrandt, F. A. "The Influence of Aging in Man Upon His Capacity for Physical Work, and Upon His Cardio-Vascular Response to Exercise," American Journal of Physiology. CXLIII (1945), 420-427.

(7) Diethelm, O. "The Aging Person; Psychological and Psychopathological Aspects of Aging." North Carolina Medical Journal. V (1944), 583-585.

(8) Donahue, Wilma T. "Education's Role in Maintaining the Individual's Status," Social Contributions by the Aging. Edited by Clark Tibbitts. In American Academy of Political and Social Science, Philadelphia. (Its Annals, Vol. 279.) Philadelphia: 1952, pp.115-125.

(9) Foulds, G. A., and Raven, J. C. "Normal Changes in the Mental Abilities of Adults as Age Advances," Journal of Mental Science. XCIV (1948), 133-142. Dumfries, Scotland: The Crickton Royal. Psychological Abstracts. XXII (1948), 4882.

(10) Gardner, L. Pearl. "Attitudes and Activities of the Middle Aged and Aged," American Psychologist. III (1948), 307.

(11) Gorriti, Fernando. "The Psychology of Normal Old Age." Psychological Abstracts. Translated. XXV (1951), 5219.

(12) Gray, Horace, Psychological Types," and "Changes with Age," Journal of Clinical Psychology. III (July, 1947), 273-277.

(13) Hall, G. Stanley. Senescence - The Last Half of Life. New York: D. Appleton and Company, 1923.

(14) Horvath, Elizabeth C., and Horvath, Steven M. "Physical and Mental Health in the Aged," Journal of the Iowa Medical Society. (Des Moines), XLII (February, 1952), 47-51.

(15) Houser, Phillip M. "Some Facts About the Older Worker," Proceedings of the Third Annual Meeting, Industrial Relations Research Association. Chicago: December, 1950.

(16) Dawson, P. M., and Hellebrandt, F.A. "The Influence of Aging in Man Upon His Capacity for Physical Work, and Upon His Cardio-Vascular Response to Exercise," American Journal of Physiology. CXLIII (1945), 420-427.

(17) Jones, Harold E., and Conrad, Herbert S. "The Growth and Decline of Intelligence: A Study of a Homogeneous Group Between the Ages of Ten and Sixty," Genetic Psychology Monograph. Vol. XIII, No. 3 (March, 1933).

(18) Komarovsky, Mirra. "The Voluntary Associations of Urban Dwellers," American Sociological Review. XI (December, 1946), 686-698.

(19) Kuhlen, Raymond G. "Age Trends in Adjustment During the Adult Years as Reflected in Happiness Ratings," American Psychologist. III (1948), 307.

(20) Landis, Judson T. "What is the Happiest Period of Life?" School and Society. LV (June, 1942), 643-645.

(21) Lansing, Albert I. (ed.). Cowdry's Problems of Aging. 3d ed. Baltimore: The Williams and Williams Company, 1952. (Chapter 9: "The Eye," by Jonas S. Friedenwald.) (Chapter 10: "The Ear," by W.P. Covell.) (Chapter 18: "Aging of Homeostatic Mechanisms," by Nathan W. Shock.)

(22) Lawton, George. "Aging Creatively," Living Through the Older Years. Edited by Clark Tibbitts. Proceedings of the Charles A. Fisher Memorial Institute on Aging. Ann Arbor: University of Michigan Press, 1949, pp. 113-129.

(23)_____. "Mental Decline and Its Retardation," Science Monthly. (New York), LVIII (1944), 313-317.

(24) Lehman, Harvey C. "Some Examples of Creative Achievement During Later Maturity and Old Age," Journal of Social Psychology. XXX (1949), 49-79.

(25) Litwinski, Leon. "Mental Development and Decline as a Function of Age." Archives de Psychologie. (Geneva), XXXIII (1950), 49-70. Psychological Abstracts. XXV (1951), 1623.

(26) Lorge, Irving. "Adult Learning," Adult Education. Danville, Illinois: Adult Education Association of the United States of America. II, No. 5 (June, 1952), 156-159.

(27)_____. "Intellectual Changes During Maturity and Old Age." Review of Educational Research. XI (December, 1941), 553-561. XIV (December, 1944), 438-445. XVII (December, 1947), 326-332.

(28)_____. "Psychology and our Older People," Age Is No Barrier. Legislative Document No. 35. Albany: New York State Joint Legislative Committee on Problems of the Aging. 1952, pp. 62-64.

(29)_____. Unpublished typewritten lectures on the Psychology of the Adult.

(30) Lorge, Irving, and Kushner, Rose. "Characteristics of Adults Basic to Education," Review of Educational Research. XX (June, 1950), 171-179.

(31) Maxham, Helen Kerr. "A Study of the Viewpoints of Women of Different Age Groups," Journal of Genetic Psychology. LXIV (June, 1944), 311-315.

(32) Morgan, Christine M. "The Attitudes and Adjustments of Recipients of Old Age Assistance in Upstate and Metropolitan New York," Archives of Psychology. Edited by R. S. Woodworth. No. 214. New York: 1937.

(33) Nestrick, W. Virgil. Constructional Activities of Adult Males. New York: Bureau of Publications, Teachers College, 1939.

(34) Raven, J. C. "The Comparative Assessment of Intellectual Ability." British Journal of Psychology. Dumfries, Scotland: The Crickton Royal, XXXIX (1948), 12-19.

(35) Reeves, J. W., and Slater, Patrick. "Age and Intelligence in Relation to Leisure Interests," Occupational Psychology. (London), XXI (July, 1947), 11-124.

(36) Ruger, Henry A., and Stoessiger, Brenda. "On the Growth Curves of Certain Characteristics in Man (Males)," Annals of Eugenics. Vol. II, Parts I and II. Cambridge University Press. April, 1927.

(37) Stieglitz, Edward J. (ed.). Geriatric Medicine. Philadelphia: W. B. Saunders Company. 1949. (Chapter 3: "Psychological Changes of Normal Aging." by Anton J. Carlson.) (Chapter 5: "Mental Changes with Normal Aging." by Walter R. Miles and Catharine C. Miles.) (Chapter 17: "Normal Mental Changes." by Winfred Overholser.)

(38) Stieglitz, Edward J. "The Personal Challenge of Aging--Biological Changes and Maintenance of Health," Living Through the Older Years. Edited by Clark Tibbetts. Ann Arbor: University of Michigan Press, 1949.

(39) Strong, Edward K., Jr. Change of Interests with Age. Stanford University Press, 1953.

(40) Thorndike, Edward L. Adult Interests. New York: The Macmillan Company, 1935.

(41) _____, Adult Learning. New York: The Macmillan Company, 1936.

(42) Tibbitts, Clark, and Donahue, Wilma. "Developments in Education for Later Maturity," Review of Educational Research. Vol. III, Chapter II, (June, 1953).

(43) Tibbitts, Clark (ed.). Living Through the Older Years. Proceedings of the Charles A. Fisher Memorial Institute on Aging. Ann Arbor: University of Michigan Press, 1949. (Chapter IV: "Changes in Psychological Processes with Aging," by Wilma Donahue.)

(44) U. S. Federal Security Agency. Fact Book on Aging. Committee on Aging and Geriatrics. Washington: Government Printing Office, 1952.

(45) U. S. Public Health Service. National Health Service Bulletins Nos. 5, 6, 7. National Health Survey Hearing Study Series Bulletin No. 3. National Institute of Health, Division of Public Health Methods. Washington: Government Printing Office.

(46) Wechsler, D., and Shakow, D. "Intellectual Changes with Age." Public Health Report. "Washington", Supplement No. 168, pp. 43-52.

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